IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte Estelle
Appeal No. _____

Applicant:	Peter W. Estelle
Serial No.:	09/702,493
Filed:	October 31, 2000
Group Art Unit:	3754
Examiner:	Mr. Eric Keasel
Title:	**SELF ADJUSTING SOLENOID DRIVER AND METHOD**
Atty Docket No.	NOR-937

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Alexandria, VA 22313-1450

TRANSMITTAL OF APPEAL BRIEF
(PATENT APPLICATION - 37 CFR §1.192)

1.   Transmitted herewith, in triplicate, is the APPEAL BRIEF with respect to the Notice of Appeal filed on <u>October 16, 2003</u>.

CERTIFICATE OF EXPRESS MAILING
37 CFR §1.10

I hereby certify that, on <u>December 16, 2003</u>, this correspondence is being deposited with the United States Postal Service in an envelope addressed to Mail Stop Appeal Briefs - Patents, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 as "Express Mail Post Office to Addressee" Mailing Label No. <u>EV354971214US</u>,

Kenneth Eads   12/16/03
Kenneth Eads   Date
(Name of Person Mailing Paper)

2. STATUS OF APPLICANT
This application is on behalf of:
    X Other than a small entity.
    ___ A small entity.
        A statement:
        __ is attached.
        __ was already filed.

3. FEE FOR FILING APPEAL BRIEF
Pursuant to 37 C.F.R. 1.17(c), the fee for filing the Appeal Brief is:
    __ small entity $165.00
    X other than a small entity $330.00

Appeal Brief fee due $330.00

4. EXTENSION OF TERM
The proceedings herein are for a patent application and the provisions of 37 CFR §1.136 apply. (complete (a) or (b), as applicable)

(a) __ Applicant petitions for an extension of time under 37 C.F.R. 1.136 for the total number of months checked below:

Extension (Months)	Fee for other than a Small Entity	Fee for Small Entity
__ one month	$ 110.00	$ 55.00
__ two months	$ 420.00	$ 210.00
__ three months	$ 950.00	$ 475.00
__ four months	$1480.00	$ 740.00
__ five months	$2010.00	$1005.00
	FEE $_____	

(b) **X** Applicant believes that no extension of term is required. However, this conditional petition is being made to provide for the possibility that Applicant has inadvertently overlooked the need for a petition and fee for extension of time.

5. TOTAL FEE DUE
The total fee due is:
    Appeal Brief Fee $ **330.00**

6. FEE PAYMENT
    X Attached is a check in the sum of $330.00
    ____ Charge Account No. 23-3000 the sum of $_____
    A duplicate of this transmittal is attached

7. **FEE DEFICIENCY**

   X If any additional extension and/or fee is required, this is a request therefor and to charge Deposit Account No. 23-3000.

   X If any additional fee for claims is required, charge Deposit Account No. 23-3000.

Respectfully submitted,

WOOD, HERRON & EVANS, L.L.P.

BY _____
C. Richard Eby, Reg. No. 25,854

2700 Carew Tower
Cincinnati, OH 45202
(513) 241-2324
(513) 241-6234 (Facsimile)

Ex parte Estelle
Appeal No. _____

Applicant: Peter W. Estelle
Serial No.:   09/702,493
Filed: October 31, 2000
Group Art Unit: 3754
Examiner: Mr. Eric Keasel
Title: **SELF ADJUSTING SOLENOID DRIVER AND METHOD**
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Cincinnati, OH 45202   December 16, 2003

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BRIEF ON APPEAL

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> A. The Rejection of Claims 1-4, 16, 19 and 21-23 under 35 U.S.C.
> §103(a) over U.S. Patent No. 5,812,355 to Nojima in view of U.S.
> Patent No. 5,737,172 to Ohtsuka.

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Ex parte Estelle

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BRIEF ON APPEAL

I.   Real Party in Interest

The real party in interest is Nordson Corporation, of Westlake, Ohio, which is the assignee of the present invention.

II.   Related Appeals and Interferences

There are no related appeals or interferences known to Appellant or the Appellant's legal representative that will directly affect or be directly affected by or have a bearing on the decision of the Board in the present appeal.

III. Status of the Claims

Claims 1-4, 16, 19 and 21-23 are pending and subject to this appeal. In a first Office Action dated December 6, 2001, the originally filed claims 1-23 were subject to a three-way restriction as follows: Group I - claim 12, Group II - claims 1-4 and 13-23 and Group III - claims 5-11. In addition, the Office Action identified 3 Species in association with the Group II claims. In an Amendment and Response dated January 7, 2002, Applicant elected Group II, Species IIA identified by Applicant as claims 1-4, 16 and 19-23 and added claims 24 and 25. Thus, claims 5-15, 17, 18, 24 and 25 were withdrawn from further consideration. In an Amendment and Response dated July 11, 2002 filed in reply to a nonfinal Office Action dated April 11, 2002, Applicant cancelled claims 5-15, 17, 18, 20, 24 and 25; and claims 1-4, 16, 19 and 21-23 were amended. In an Amendment and Response dated November 7, 2002 filed in reply to a final Office Action dated September 10, 2002, Applicant amended claims 1, 4 and 21, which amended claims were entered on the record in a Request of Continuing Examination filed December 6, 2002. No further amendments were made to the claims during the continuing examination.

Claims 1-4, 16, 19 and 21-23 stand rejected under 35 U.S.C. §103(a) over U.S. Patent No. 5,812,355 to Nojima in view of U.S. Patent No. 5,737,172 to Ohtsuka.

IV. Status of Amendments

There are no amendments pending after final in this application.

V.   Summary of th Inv ntion

The present invention relates to an improved driver circuit for an electrically operated fluid dispensing gun for dispensing a wide variety of fluids, for example, adhesives, flux, grease, etc, as droplets, dots or a continuous bead or spray. The performance, that is, the dispensing gun operating speed, can be made faster by using a higher voltage power supply; however, simply plugging in a higher voltage power supply without other changes can result in overheating of the gun driver circuit. Replacing the gun driver circuit is labor intensive and expensive, and therefore, an improved gun driver circuit that automatically provides an efficient operation of the dispensing gun in response to power supplies of different voltages is very desirable.

As shown in Fig. 1, with an electric dispensing gun 20, a magnetic coil 54 is energized to remove a valve element 40 on the end of a valve stem 34 from a seat 42, thereby allowing fluid to be dispensed. The valve stem 34 is returned to the seat by a return spring 60 after the coil 54 is deenergized. The magnetic coupling between a magnetic coil 54 and its armature or core 52 attached to the valve stem 34 is not efficient, and therefore, the magnetic coil is energized with a shaped two stage current waveform in a known manner. Referring to Fig. 2, to open the dispensing valve 22, an initial current magnitude I_{pk} is first applied for a duration or period of time T_{pk} in response to a trigger pulse. However, that initial peak current is not required to maintain the valve stem 34 in its open position; and a continued application of the peak current to the coil is first, inefficient, and second, creates unnecessary heat in the coil. As shown in Fig. 1, the coil 54 is

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located in the proximity of the dispensing valve 22 in which the fluid to be dispensed is located; and if the coil adds heat to the dispensing valve, the viscosity of the fluid changes, which can adversely impact the fluid dispensing process. Thus, to avoid excess heat, the current is reduced to a lesser hold level I_h for the remaining period of the on time T_{on}. When the dispensing valve 22 is to be closed, the current is reduced to a substantially zero value; and the valve 22 is closed by the return spring 60. It is known to use the above-described waveform with dispensing valves as well as other devices operated by a magnetic coil.

Intuitively, at this point, one can appreciate that if a power supply having a higher voltage is used, given a constant load, a greater current is applied during the peak current period; and the valve actuation time is shortened. However, as previously discussed, the greater current will result in more heat being generated, especially in the driver circuit, which is potentially detrimental to the fluid dispensing process.

The present invention provides a driver circuit that <u>automatically adjusts the duration of the peak current period as an inverse function of the magnitude of the power supply</u>. So, if a higher voltage power supply is used, the driver circuit operates to reduce the duration of the peak current T_{pk} as shown in Fig. 2A. Thus, the higher current is applied over a shorter time, and less heat is generated by the coil.

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VI. Issu

1.   The issue on appeal is whether the Examiner has presented a prima facie case of obviousness under 35 U.S.C. § 103(a) in rejecting claims 1-4, 16, 19 and 21-23.

VII. Grouping of Claims

For purposes of this appeal, claims 1-4, 16, 19 and 21-23 should stand or fall together.

VIII. Argument

Claims 1-4, 16, 19 and 21-23 stand rejected under 35 U.S.C. §103(a) over U.S. Patent No. 5,812,355 to Nojima in view of U.S. Patent No. 5,737,172 to Ohtsuka.

Claim 1 is the only independent apparatus claim in this application and reads as follows:

1.   A fluid dispenser for dispensing a fluid onto a substrate comprising:

a dispensing valve movable between open and closed positions for controlling a flow of the fluid from said fluid dispenser;

a solenoid, the operation of said solenoid being effective to cause said dispensing valve to move between the open and closed positions;

a power supply having an output voltage; and

a driver circuit electrically connected to said solenoid and said power supply and providing an output signal to said solenoid having an initial peak current with a variable duration followed by a hold current, the duration of said initial peak current varying as a function of the output voltage of said power supply.

Claim 1 recites a driver circuit that provides "an output signal...having an initial peak current with a variable duration followed by a hold current, the duration of said peak current varying as a function of the output voltage of said power supply." In other words, to control the power dissipation, and hence, the heat, in the coil, the claimed apparatus changes the duration of the peak current in the coil and not the peak current magnitude.

Claim 16 is representative of the three independent method claims 16, 19 and 23.

16.   A method of operating a fluid dispenser for dispensing a fluid onto a substrate, the fluid dispenser having a dispensing valve being movable between open and closed positions for controlling a flow of the fluid from the fluid dispenser, a solenoid having a coil in electromagnetic communication with an armature being movable through a displacement by energizing the coil, the operation of the solenoid being effective to cause the dispensing valve to move between the open and closed positions; the method comprising:

providing a power supply having a voltage;

producing an output signal having an initial peak current with a variable duration followed by a hold current, the duration of the initial peak current varying as a function of the voltage of the power supply; and

applying the output signal to the coil of the solenoid, thereby automatically changing the operation of the dispensing valve as a function of the voltage of the power supply.

All of the method claims 16, 19 and 23 have a step substantially similar to the following step in claim 16: "<u>producing an output signal having an initial peak current with a variable duration followed by a hold current, the duration of the initial peak current varying as a function of the voltage of the power supply</u>." Again, to control the power dissipation, and hence, the heat in the coil, the claimed methods change the duration of the peak current in the coil and not the peak current magnitude.

The Examiner's rejection of claims 1-4, 16, 19 and 21-23 under 35 U.S.C. §103(a) as being unpatentable over Nojima (5,812,355) in view of Ohtsuka (5,737,172) should be reversed because the claimed invention of producing a driver circuit output signal having a variable duration initial peak current followed by a hold current is neither taught nor suggested by the cited prior art. There is agreement that Nojima teaches an electric gun driver in which the duration of the pull-in or peak current is selectable by the operator and does not change with changes in line voltage; however, there is disagreement with respect to the teaching of Ohtsuka.

Ohtsuka relates to an electromagnetic contactor that can be connected to different voltages, for example, 100 volts or 200 volts, and further, controls movement of a movable iron core in order to mitigate the physical impact of the movable core colliding with a fixed core. Ohtsuka describes a process of pulse width modulating a switching element 2 of Fig. 2 with variable duration pulses (F_1,

F_2 of Fig. 4) that are shown in curve (e) of Fig. 6, wherein the duty cycles of the pulses F_1, F_2 vary inversely with the magnitude of the applied voltage. In other words, if the applied voltage increases from 100 volts to 200 volts, the duty cycles of the pulses F_1, F_2 will be shorter, thereby maintaining a substantially constant current magnitude in the coil as shown by curve (f) of Fig. 6. It is important that the duty cycles of the pulses F_1 and F_2 not be confused with the duration T_1 of the closing current also shown in curve (f) of Fig. 6. The duty cycles of the pulses F_1 and F_2 are controlled by the applied voltage magnitude, whereas the duration of the closing operation T_1 is controlled by timer 16 of Fig. 3.

This technique of controlling the current magnitude in a coil by pulse width modulating power switches is known and also described in other references such as Oyama et al. and the Japanese Laid Open Publication No. 145619/1987 discussed in detail starting at page 5 of Appellant's Amendment and Response dated July 2, 2003. Japanese Laid Open Publication No. 145619/1987 is identified as prior art in Ohtsuka at col. 2, line 27 - col. 3, line 21 and in Figs. 8-10. In those references, a duty cycle of a pulse width modulation of a power switch is changed in inverse proportion to changes in supply voltage to a coil driver circuit. Hence, as the power supply voltage goes up, the duty cycle of the pulse width modulated power switch is reduced; and the current magnitude in the coil is reduced, thereby maintaining a substantially constant power dissipation to prevent excess coil heating. With those references, changing the duty cycle of the pulse width modulation of the power switches, changes the current magnitude in the coil, but the duration of the peak or closing current in the coil does not change, as is

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clearly shown by the waveforms in those references, which show coil currents in response to different power supply voltages.

Ohtsuka operates in a similar manner to change the duty cycle of the pulse width modulation of the switching element 2 in a manner inversely proportional to changes in the applied voltage. However, Ohtsuka does not show the current waveforms of coil current resulting from different applied voltages. Ohtsuka only shows a single waveform (f) of Fig. 6. The current appeal arises from a disagreement as to whether Ohtsuka discloses or suggests that the closing pulse duration T_1 of waveform (f) of Fig. 6 in Ohtsuka is variable. The final Office Action argues in the affirmative, but Appellant disagrees. Therefore, a more detailed review of Ohtsuka is in order.

As shown in Fig. 2, switching element 2 is operated by a control signal F provided to a driver 11. As shown in Fig. 4, the signal F can be F_1 having a larger variable duty cycle, which produces a larger closing current magnitude in the coil for initially moving the armature to a switched position. Alternatively, F can be F_2 having a smaller variable duty cycle, which produces a lesser current magnitude in the coil for holding or maintaining the armature in the switched position. During the closing operation, the variation in duty cycle is described beginning at column 13, line 13 and is summarized as follows.

As shown in Fig. 4, a reference triangular wave curve G is provided by the reference triangular wave generating circuit 50 of Fig. 3. The reference triangular wave curve G is defined by three acute angles alpha, beta and gamma. P and Q in Fig. 4 are examples of reference levels that are provided by the closing

pulse computing circuit 17 depending on the magnitude of the applied voltage. For example, if the applied voltage is lower, level Q provides an output H from comparator 83 with a larger duty cycle as indicated by the solid line in Fig. 4. But, if the applied voltage is higher, level P provides an output I with a smaller duty cycle indicated by the dashed lines in Fig. 4. As shown in Fig. 5A, the closing pulses F_1 have a range of duty cycles of 32%-100% depending on the magnitude of the applied voltage. Over the duration T_1 of the closing current, pulses F_1 of Fig. 4 are produced from an AND circuit 31 (Fig. 3) having as inputs, the signal H and an output J from a building up pulse generating circuit 51. A leading edge of an ON time of the pulses F_1 is determined by P or Q intersecting the triangular reference waveform G, and the trailing edge of the ON time of the pulses F_1 is determined by the trailing edge of the waveform J. Since P or Q are determined by the applied voltage in accordance with the curve of Fig. 5A, the ON time or duty cycle of the pulses F_1 is a function of the applied voltage. Thus, pulses F_1 pulse width modulate the power switch 2 as shown by curve (e) of Fig. 6 over a duration T_1 to produce the coil current magnitude shown in curve (f) of Fig. 6 over the duration T_1.

Inputs to a pulse closing computing circuit 17 of Fig. 3 include, at col. 13, lines 4-8 "an output from the timer circuit 16 for switching the pulse computing circuit (i.e., from 17 to 18) from closing to maintenance in accordance with a time limit (T_1 in FIG. 6) for completion of closing after start of load of operational voltage." Further, inputs to the maintenance pulse computing circuit 50 include, at col. 13, lines 60-63, an "output from the timer circuit 16 switching the pulse computing circuit (from circuit 17 to 18) from closing to maintenance

when a specified period from start of load of voltage until completion of closing."

Thus, clearly the purpose of the timer 16 is to establish the duration T_1 by delineating an end of the closing current and the start of the maintenance current.

In the maintenance operation, the triangular reference waveform G is compared with waveforms P or Q from maintenance pulse computing circuit 18 (Fig. 3) in comparator 82. P or Q are created in accordance with a duty cycle to applied voltage indicated in Fig. 5B. The result is an input to an AND circuit 30 having another input represented by waveform K (Fig. 4) produced by the lagging edge pulse generating circuit 52. The leading edges of the waveforms K provide the leading edges of the ON times of the pulses F_2, and the trailing edges of the ON times of the pulses F_2 are provided by the intersection of P or Q with the triangular reference waveform G. Thus, upon the expiration of the closing current duration T_1, the pulses F_2 are used to drive the switching element 2 in a manner shown by the curve (e) of Fig. 6 to provide a lesser maintenance current magnitude in the coil as shown at corresponding points on the curve (f) of Fig. 6.

Thus, Ohtsuka provides a pulse width modulation of the switching element 2, so that the current magnitude in the coil remains substantially constant regardless of the magnitude of the applied voltage. There is nothing in the above described operation that requires or suggests that the duration of the closing current T_1 needs to change or does change.

Ohtsuka, at column 3, lines 40-59, describes the disadvantages of the prior art as being unable to distinguish between AC and DC power supplies and also being unable to execute minute control of the iron core. Ohtsuka reduces the current

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magnitude at particular times during the closing current in order to mitigate the physical impact of the movable core colliding with a fixed core. As further described at col. 13, lines 24-40, during the closing period T_1, if the iron cores have not collided as represented by an input from the closing pulse computing circuit 17, the movable section displacement computing circuit 19 reduces the duty cycle of the pulses driving the switching element 2 as represented by the pulses i and j in waveform (e) of Fig. 6. That reduction in duty cycle produces a lower magnitude current in the coil as indicated at corresponding points in waveform (f) of Fig. 6. Subsequently, after start of the collision of the iron cores, the original duty cycle is restored to provide the pulses h at the end of T_1 in waveform (e) of Fig. 6. Thus, it is possible to minimize an impact in the point contact or collision of iron cores as well as suppress the bounce of the movable core by changing the duty cycle of the control signal F operating the switch element 2 and hence, the current magnitude in the coil. It should be noted that in the above operation, even though the coil current magnitude is changed at different points in the duration T_1 of the closing current, the length of the duration T_1 of the closing current does not change.

In the final Office Action dated July 16, 2003, in paragraph 3, claims 1-4, 16, 19 and 21-23 were rejected under 35 U.S.C. §103(a) over Nojima in view of Ohtsuka. Further, the Office Action states that

> Nojima...fails to disclose the details of the driver circuit initial peak current having a duration determined as an inverse function of the output voltage of the power supply. Ohtsuka discloses a similar driver circuit with initial peak and holding currents with the pulse width for a voltage value decreasing in inverse proportion to the power supply voltage.

Further in the Response to Arguments section in paragraph 4, the Office Action further states that

> However, Ohtsuka clearly discloses that the initial peak current duration varies in inverse proportion to the power supply voltage (see column 4, lines 54-59, column 5, lines 15-17, column 16, lines 35-40 and lines 66-67. The rest of the time within T_1 does not become arbitrarily longer or shorter in response to the variations in the power supply voltage to keep T_1 constant.

We will now examine each of the above references to Ohtsuka. Col. 4, lines 54-59 are reproduced below. The bracketed references to the Ohtsuka drawings are outside the quote.

> In the electromagnetic contactor and a method of controlling the same according to the present invention, a pulse width [F_1, F_2 of Fig. 4] for a voltage value decreases in inverse proportion to the voltage value, so that the absorbing force and an input to a coil can be maintained at a constant level, irrespective of the voltage value.

In the context of Ohtsuka, it is submitted that the above sentence refers to the pulses F_1, F_2 of Fig. 4 that have a duty cycle varying inversely with the applied voltage as previously described and are used to drive the switching element 2 as shown in curve (e) of Fig. 6. The is nothing in Ohtsuka that describes or suggests that the duration T_1 of the closing current, shown in curve (f) of Fig. 6, varies inversely with the applied voltage.

The Ohtsuka invention is summarized in col. 5, lines 8-22 that are reproduced below. In the quotation below, lines 15-17 referenced by the Office Action are underlined, and the bracketed references to the Ohtsuka drawings are outside the quote:

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In the electromagnetic contactor and a method of controlling the same according to the present invention, a reference wave [G of Fig. 4] having 3 acute angles .alpha., .beta., and .gamma. and also having a specified frequency is generated, a reference pulse for closing or for maintenance is generated respectively according to a building up or a lagging edge of the reference voltage, a pulse [H or I] is generated by comparing a level [P or Q] of detected voltage value to the reference wave level [G], and also a control pulse [F$_1$, F$_2$ of Fig. 4] for closing or maintenance, in which a pulse width decreases in association with increase of the detected voltage value is generated according to the logical product of the above two values [H or I and G], so that a pulse for closing or for maintenance [F$_1$, F$_2$ of Fig. 4] can easily be set up at a free ratio with one reference wave [G] by changing an angle [alpha, beta or gamma] in building up or a lagging edge thereof and also fine controls over the angle is very easy.

It is submitted that the underlined clause cited in the Office Action does not support an argument that the duration T$_1$ of the closing current as shown in curve (f) of Fig. 6 varies but instead is a description of the duty cycle variation of the control pulses [F$_1$, F$_2$ of Fig. 4] used to vary the magnitude of the closing current over the closing current duration T$_1$.

Col. 16, lines 35-40 are reproduced below, and the Ohtsuka invention is summarized in a manner almost identical to the above reference to col. 5. Again, the bracketed references are outside the quote:

In the electromagnetic contactor and a method of controlling the same according to the present invention, a pulse width [F$_1$, F$_2$ of Fig. 4] for a voltage value becomes smaller in inverse proportion to the voltage

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value, so that coil input and an absorbing force can be maintained at a constant value irrespective of the voltage value.

This again describes the fundamental operation of Ohtsuka and makes no reference to varying the duration of the closing T_1 shown in curve (f) of Fig. 6 inversely with the voltage value.

Col. 16, line 57-col. 17, line 5 are reproduced below and again summarizes the Ohtsuka invention. Lines 66-67 referenced by the Office Action are underlined, and the bracketed references are outside the quote:

In the electromagnetic contactor and a method of controlling the same according to the present invention, a reference wave [G of Fig.4] having three acute angles .alpha., .beta., and .gamma. each corresponding to a set-up frequency is generated, a reference pulse [H or I] for closing or for maintenance is generated according to building up or lagging edge of the reference wave, the reference pulses [H or I] being generated by comparing a level [P or Q] of a detected voltage value to the level of the reference wave [G], and a control pulse [F_1, F_2] is generated for closing or maintenance with <u>a pulse width decreasing in association with increase of the detected voltage value according to a logical product of the pulses</u>, so that pulses for closing and maintenance can easily be generated at a free width ratio [see col. 14, lines 39-47] by changing angles for building up or lagging edge with one reference wave and also fine adjustment of the angles above can easily be carried out.

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It is submitted that the above-underlined clause cited in the Office Action does not in any way support an argument that the duration T_1 of the closing current as shown in curve (f) of Fig. 6 is variable.

In view of the above, a prima facie case of obviousness is not made because Nojima and Ohtsuka et al. in combination do not teach or suggest the claimed inventions. Each of the independent claims requires "an output signal...having an initial peak current with a variable duration followed by a hold current, the duration of said peak current varying as a function of the output voltage of said power supply." In Nojima, the pull-in or peak current duration is selectable by the operator, but once selected, is fixed during the operation of the solenoid. In Ohtsuka, as shown in curve (e) of Fig. 6, over the closing current duration T_1, the second switching element 2 is pulse width modulated by the pulses g, h, i and j to vary the current magnitude in the coil 120 as shown in curve (f) of Fig. 6. It is submitted that there is no teaching or suggestion in Ohtsuka that the closing current duration T_1 is in any way variable. It is further submitted that, as described at col. 9, lines 20-30, the closing current duration T_1 is, under normal operating conditions, determined exclusively by the operation of timer circuit 16.

A prima facie case of obviousness is not made because Nojima and Ohtsuka et al. are directed to different problems than the claimed invention. Nojima is directed to providing a power supply that can be connected to a range of line voltages. Ohtsuka is directed to providing an electrical contactor that can be connected to different voltages as well as mitigating the physical impact of the movable core colliding with a fixed iron core.
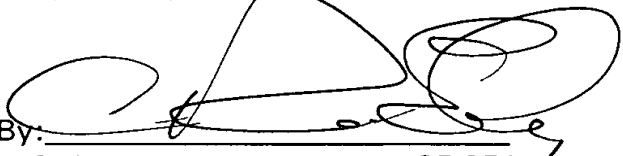
-16-

In contrast, the claimed invention is directed to improving the performance of a dispensing valve by simply using a higher voltage power supply without having to replace a valve driver circuit and without operating the coil inefficiently. By shortening the duration of the peak current to match the response time of the dispensing valve, no more current than is required is provided to the coil and therefore, no more heat than necessary is generated by the coil.

It is submitted that the cited references in combination do not teach suggest or motivate one to vary the duration of the peak current as required by the claims; and therefore, the rejection of claims 1-4, 16 and 19 and 21-23 under 35 U.S.C. §103(a) over Nojima in view of Ohtsuka should be reversed.

IX.   Conclusion

For the reasons stated, Appellant respectfully urges the Board to reverse the rejection of claims.

Respectfully submitted,

By:

C. Richard Eby, Reg. No. 25,854

WOOD, HERRON & EVANS, L.L.P.
2700 Carew Tower
Cincinnati, Ohio 45202
PH: (513) 241-2324, Ext. 292
FX: (513) 241-6234

1.   A fluid dispenser for dispensing a fluid onto a substrate comprising:

a dispensing valve movable between open and closed positions for controlling a flow of the fluid from said fluid dispenser;

a solenoid, the operation of said solenoid being effective to cause said dispensing valve to move between the open and closed positions;

a power supply having an output voltage; and

a driver circuit electrically connected to said solenoid and said power supply and providing an output signal to said solenoid having an initial peak current with a variable duration followed by a hold current, the duration of said initial peak current varying as a function of the output voltage of said power supply.

2.   The fluid dispenser of claim 1 wherein said driver circuit automatically varies the duration of said initial peak current as a function of the output voltage of said power supply.

3.   The fluid dispenser of claim 2 wherein said driver circuit automatically varies the duration of said initial peak current as an inverse function of a magnitude of the output voltage of said power supply.

4. The fluid dispenser of claim 1 wherein the driver circuit further comprises a peak current duration control connected to said power supply and providing a signal varying as an inverse function of the output voltage of said power supply.

Claims 5 - 15 (canceled)

16. A method of operating a fluid dispenser for dispensing a fluid onto a substrate, the fluid dispenser having a dispensing valve being movable between open and closed positions for controlling a flow of the fluid from the fluid dispenser, a solenoid having a coil in electromagnetic communication with an armature being movable through a displacement by energizing the coil, the operation of the solenoid being effective to cause the dispensing valve to move between the open and closed positions; the method comprising:

    providing a power supply having a voltage;

    producing an output signal having an initial peak current with a variable duration followed by a hold current, the duration of the initial peak current varying as a function of the voltage of the power supply; and

    applying the output signal to the coil of the solenoid, thereby automatically changing the operation of the dispensing valve as a function of the voltage of the power supply.

Claims 17 - 18 (canceled)

19.   A method of operating an electrically operated fluid dispenser for dispensing a fluid onto a substrate, the fluid dispenser having a dispensing valve operatively connected to an electrically operated solenoid, the dispensing valve being movable between open and closed positions for controlling a flow of the fluid from the fluid dispenser, the method comprising:

providing a power supply having a voltage;

producing an output signal having an initial peak current with a variable duration followed by a hold current, the duration of the initial peak current varying as a function of the voltage of the power supply; and

applying the output signal to the electrically operated solenoid, thereby automatically changing the operation of the dispensing valve as a function of the voltage of the power supply.

20. (canceled)

21.   The method of claim 19 further comprising varying the variable duration of the initial peak current of the output signal as an inverse function of the voltage of the power supply.

22.   The method of claim 19 further comprising:

producing a feedback signal representing current in the solenoid; and

producing the hold current as a function of the feedback signal.

23.   A method of operating an electrically operated fluid dispenser for dispensing a fluid onto a substrate, the fluid dispenser having a dispensing valve operatively connected to an electrically operated solenoid, the dispensing valve being movable between open and closed positions for controlling a flow of the fluid from the fluid dispenser, the method comprising:

producing a first output signal having an initial peak current with a variable duration followed by a hold current, the duration of the initial peak current varying as a function of a first nominal voltage of a first power supply connectable to the fluid dispenser;

applying the first output signal to the solenoid;

producing a second output signal having an initial peak current with a variable duration followed by a hold current, the duration of the initial peak current varying as a function of a second nominal voltage of a second power supply connectable to the fluid dispenser in place of the first power supply; and

applying the second output signal to the solenoid.

Claims 24 - 25 (canceled)